Section 9 Greenway Planning and Design

9.1 Trail Design Criteria

The need for recreational hiking trails in recent years has eclipsed previous expectations. Communities faced with providing public trails based upon national and state recreation standards reveal two miles per 1,000 population is required, exclusive of bike trails rated at three miles per 1,000 population. Trail design differences vary between user groups, so it's imperative that the intended users be identified early in the design process to avoid user conflicts. Hiking and biking trails, segregated and multiuse trails, surface material types, and site development restrictions provide a composite matrix of design scenarios for recreational trail planning.

9.1.a Four main factors determining how trails are designed include: the use, the number of expected users, the surrounding context, and location limitations.

The intended use typically drives the initial design, making future modifications and retrofits costly or impossible within narrow trail corridors. Different users require different trail standards, which ultimately determines trail design. Hikers, joggers, bikers, birders, mountain bikers, skateboarders, roller bladers, equestrians, cross country, and nature walkers experience the trail in different ways and as such require different trail design criteria. As more users are expected, a wider trail corridor becomes essential in order to reduce user conflicts. A paved multiuse trail permits unlimited recreational uses, while a nature trail typically is limited to non-wheeled uses.

The number of expected users will influence the type of trail surface, the scale of design improvements, the cross section details, and even dictate if the use is too intense for the proposed site. A hiking trail with 2,000 projected users requires few improvements; however, the same trail expecting 20,000 users must accommodate them as well as increased maintenance into the trail design. User surveys are essential at this stage in the planning process, which help identify anticipated issues before they become problems.

Two additional variables are surrounding context (wilderness, rural, suburban, and urban) and location limitations (environmental constraints, slope, terrain, access, materials, etc.). The ***Trail Design*** graphic provides general trail recommendations. If the trail expects significant numbers of users, the trail width will need to be increased and perhaps the trail surface improved. If the trail corridor is within an environmentally sensitive area, the width may need to be reduced, and/or trail programs altered to restrict some users. These standards are guidelines that must respond to variables unique to each site and locality.

9.1.b Basic Differences in Trail Types

There as many trail types as there are recreational uses. The two basic types of trails are motorized and non-motorized. Differences between hiking and biking trails, on-road bikeways versus segregated multiuse trails, motorized vehicular and non-motorized vehicular trails, even land versus water trails, influence the design of any trail facility. The main types of trail facilities that are dealt with in this plan are hiking trails, segregated multiple use trails, on-road bikeways, mountain bike trails, equestrian trails and water trails.

The term hiking trail denotes certain pedestrian uses such as "walkers, hikers, joggers, runners, persons confined to wheelchairs, bird-watchers, nature lovers, picnickers, rock climbers, hunters, cross-country skiers, and a variety of other users who traverse diverse landscapes on foot." [74] Design specifications vary among localities with inherent flexibility to respond to varying land types and user traditions. Although a hiking trail in a wilderness location is typically 2-6' wide, a hiking trail in a suburban location would require a wider width for safety and security.

Segregated multiuse (or multiple use) trails are intended for pedestrians, bikers and other non-motorized users such as skate boarders, roller bladders, baby strollers, and scooters. These facilities require a much wider surface, 10-foot minimum and 12-foot preferred to eliminate user conflicts. In instances where the number of users exceeds safety tolerances, the trail may need to be widened, or another parallel trail could be built to accommodate either separate uses or provide one-way directional traffic. Multiuse trails meet the needs of the broadest cross-section of trail users and should be recommended whenever practicality permits.

On-road bikeways have witnessed tremendous popularity, growth and development in recent years. As a result, bikeways are now an integral part of the transportation plan on the Peninsula. Shoulder bike lanes are typically 5 feet in width and designated with signage and/or pavement markings, and shared roadway corridors put bikes and cars within the same travel lane. While there is growing support for more multiuse trails, the development of multiuse trails does not eliminate the need for shoulder bike lanes. [75] In fact, they should be planned together in order to provide the safest form of recreation and alternative transportation uses.

Mountain bike trails are considered special-use facilities that are incompatible with other recreation types. The speed of bikes, rugged terrain, and trail rutting make trail usage difficult for all other trail users except equestrians, however, the mountain biker and the equestrian are incompatible. Mountain bike corridors must be designed in such a manner as to permit cutting new trails within the same corridor when old routes become too eroded or unsafe.

Equestrian trails provide a trail experience unlike any other. In general, the trail surface should be soft with vertical clear heights of 12-feet. Horses can easily be startled and pose a significant risk to the rider, so incompatible uses must be segregated. One requirement for horse trails requires proximity to nearby stables, otherwise, parking facilities will need to be constructed for vehicles with trailers. While the percentage of users per population has been declining (currently 6%), the popularity of the sport is increasing.

Aquatic trails, also known as blueways, are growing in popularity. Access to three major rivers and numerous tidal and non-tidal creeks make blueway opportunities plentiful in the County. Different blueway trail experiences between motorized uses (outboards, water-skiing, and jet skis) create noise and turbulence that may disrupt the experience of rowers, canoes, and kayaks. While signage may educate users to be considerate, there are few enforcement mechanisms available to ensure waterways are safe and enjoyable.

[74] Greenways, Charles Flink and Robert Searns, sponsored by the Conservation Fund, 1993, p.187.
[75] AASHTO, Guide for the Development of Bicycle Facilities, 1999, p. 33.

Trail Width Standards

	Pedestrian	AASHTO[76]	Multiuse bike & pedestrian
Wilderness trails	2-6’	n/a	6-8’
Interpretive trails	7’	n/a	8-10’
Rural trails	4-8’	8’	8-10’**
Suburban trails	6-10’	12’	10-12’
Urban trails	8-14’	14-16’*	12-14’

(* 16’ width is a VDOT recommendation; 10’ for bikes and 3’ pedestrian shoulders)
(** While a 10’ minimum width is preferred, Virginia Outdoor Plan recommends 12’, p.320)
(Note: The following standards are general and require width modifications if the number of users increase beyond safety tolerances.)

Corridor Width Standards

Several trail elements influence the width of a corridor: the trail width design, safety clearances, grading and drainage, shoulder amenities and rest areas, site furnishings, signage, and visual aesthetics. Buffers may also be added to the corridor width to buffer off-site factors such as environmentally sensitive areas, residential or commercial developments, roadways, or to help separate multiple trails within the same corridor. Undulating terrain and steep topography will influence the corridor width significantly. For example, an 8’ wide trail located on 15% slopes will require a corridor width of 22.28’ for trailside grading to create a level trail with a 2’ drainage channel and 3:1 side slopes. The same trail on 25% side slopes requires 28.28’ of trailside grading. Additional corridor width should be planned if other trail elements are factored into the trail design, such as buffers.

Some jurisdictions establish a consistent policy on corridor widths that vary between 50’, 75’ and 100’. In much the same way a two-lane roadway 22’ wide requires a right-of-way (corridor) width of 50-90’, an 8-12’ trail requires a corridor width of 35-100’ (depending on the type of trail surface elements, such as buffers, that are included in the design). In general, a 50-foot corridor is sufficient for most trail systems, except where neighboring residential areas need additional buffering or where environmental constraints (steep slopes and wetlands) make trail development difficult. The actual width should be determined in the preliminary design phase.

9.1.c Trail Cross-Sections and Clear Zones

In addition to the trail surface width, the trail corridor must include 2-foot shoulders and 2-4’ clear zone widths of on each side for safety. In most cases, 2-foot shoulders can be incorporated as part of the clear zone alongside trails. These shoulders should be soft surface and graded at 2-3% for drainage. For example, a 6’ wide hiking trail should employ 2-4’ clear zones on each side creating a corridor 10-14’ wide. If bikes are included as an approved use, the clear zone must be 4’ minimum to help reduce user conflicts and trailside impacts. Clear zones must be free of trees, shrubs, signposts, utility poles, sharp objects, benches, trashcans, or any other obstruction that creates a visual obstruction, tripping hazard or potential injury. Clear zones enhance the public perception of a safe trail corridor.

[76] AASHTO American Association of State Highway and Transportation Officials, Guide for the Development of Bicycle facilities, 1999, p.33-36.

Trail Surface Materials

The type of surface material also plays a factor in trail width design. If a natural surface is proposed, high use may increase user conflicts and/or cause rutting to occur forcing trail users to migrate off the approved trail creating un-programmed trails. This action might require changing the alignment to reroute the trail or create costly repairs to the damaged trail. Ruts on trails increase ponding, subsidence, and erosion. As soil materials diminish over time, tree roots become exposed creating increased tripping hazards. These issues must be factored into the long-range management plan for the trail, and not considered a secondary maintenance program after minimal trail improvements are initially installed. When improved surfaces such as gravel, asphalt paving, and timber construction are proposed, the trail width must allow for ingress and egress of construction equipment, preferably from multiple access points, and also accommodate access for future maintenance upgrades to the trail.

There are numerous surface materials to choose from depending upon the expected use and planned trail type. Though not exhaustive, seven main types of trail surfaces are:

1. Option 1 - All natural surface primitive trail with minor clearing and 2' clear zones.
2. Option 2 - All natural surface hiking trail 4-8' wide with 2-4' clear zones and minor trail surface improvements to improve drainage or minimize steep cross-slopes.
3. Option 3 - Primarily a natural surface 4-8' wide with improved sections of gravel, culverts, or wooden footbridges in wetland areas. Horizontal alignments are less than 5% and cross-slopes are less than 3%. Minor drainage improvements are necessary. Provide 4' wide clear zones. Shoulder improvements optional.
4. Option 4 – Improved surfacing 6-10' uses gravel or cinders as a soft surface multiuse trail. Horizontal alignments are less than 5% (maximum 300 LF without grade change) and cross-slopes less than 3%. Full site improvements require drainage, signage, parking, public access, and 4' clear zones. Shoulder improvements optional.
5. Option 5 – Modified gravel and/or paved surface 6-10' wide with 4' soft surface shoulders. Horizontal alignments are less than 5% and cross-slopes are less than 2%. Full site improvements require drainage, signage, parking, public access, and 2-4' clear zones.
6. Option 6 – Paved surface 8-14' wide multiuse asphalt, concrete, or other impervious paving. Horizontal alignments are less than 5% and cross-slopes are less than 2%. Full site improvements require drainage, signage, parking, public access, 4'soft shoulders, and 2' clear zones.
7. Option 7- Specialty trails for equestrians, motorized uses, and blueways for canoes and kayaks.

9.1.d Health, Safety and Welfare

Various aspects of safe trail design have been illuminated throughout this document, helping trail planner's incorporate health, safety, and welfare issues into the over-all design. Providing clear zones, sight lines, preventing overhead tree limbs from falling, security issues, emergency access, animal control, fire prevention, and trail user etiquette, to name a few, collectively add to the tangible and intangible enjoyment of any trail.

9.2 Environmental Constraints

The environmental significance of any site provides a unique opportunity to showcase areas of natural beauty. Special attention must be given to providing trail locations that minimize environmental impacts while allowing users to experience the character of the site. Environmental studies include: archaeological surveys, and threatened and endangered plant and animal surveys. In some instances, a cultural assessment study may be warranted to assess impacts to adjacent areas. Some sites with special interest offer educators an opportunity to interpret significant historical and environmental sites through interpretive sign programs. Protecting mature trees, native plant communities, natural processes, habitat areas, and other dynamic ecosystem processes are of critical interest in trail planning.

Design details typically incorporate several objectives outlined in the trail management plan such as preserving the character of the site, protecting environmental features, limiting land disturbance, reducing costly construction, and providing recreational trails within appropriate corridors. Trail locations within wetland areas present the greatest obstacle to trail planning in James City County. Proposed developments typically provide mandatory 40% protected open spaces during plan review, but most of these areas are undevelopable due to steep slopes, protected wetlands (RPA), water, and highly erodible soils. These protected open spaces are capable of supporting trail facilities; however, construction costs increase dramatically when environmental site limitations restrict construction access and affordable trail surfaces. Obtaining construction permits within delineated wetlands is another design factor.

In James City County, numerous migratory birds utilize greenways and contiguous forests throughout the year as stopovers and winter habitats. This is due to the rich diversity of plant species found throughout the County. When designing trails, it is important to understand the role that flora and fauna inventories play. Since different plant and animal species emerge during different times of the year, wildflower and biotic specialists should investigate the proposed site numerous times to locate habitats to be protected. When plant habitats are discovered, if it is not possible to relocate the trail, then it may be possible to transplant some plant species off trail into areas directly adjacent to the corridor. As a result, these trails become wildflower sanctuaries that protect our natural heritage. When rare and threatened plants are discovered, the trail must be rerouted.

Subwatershed Drainage

Surface stormwater drainage is perhaps the most difficult trail design issue to properly plan for simply because it varies between seasons in frequency and intensity. Failing to correctly estimate the amount of stormwater collected within a subwatershed and where along the trail it will pass could lead to costly washouts of the trail. The effects of Hurricane Floyd astonished

Newport News Park in 1999 when it floated away numerous puncheon footbridges, creating enormous repairs to their trail.

Every watershed area can be divided into subwatersheds, herein defined as the entire surface area that collects water and transports it through a particular discharge point. These discharge points, if located along a trail, will incur trail erosion if they are under-built. The use of puncheon footbridges or culvert pipes help to channel water under or through the trail surface. The size of the subwatershed and the land use cover within these subwatersheds correspondingly relates to how much surface flow may be produced. Heavily wooded areas with mature trees and understory plants provide 90% infiltration of stormwater resulting in a 10% coefficient in surface flow runoff. Open meadows have a surface flow runoff coefficient of 20-30%, turfgrasses 30-40%, suburban areas 50-60%, and urban areas 80-90%. The more a site is developed, the more surface runoff is expected.

The length of the watershed channel also plays a factor in gauging the surface flow estimate within a subwatershed. There is greater potential for an ephemeral stream or intermittent stream to develop the longer the channel length gets. Typically, a rivulet stream begins to flow at around 300' for turfgrass land cover. While there is a science to all of this, sometimes it is hard to predict where a trail will get washed out. Another method is to walk the trail during a long and heavy downpour and record your findings. Areas experiencing significant flows should use boardwalk bridges or puncheons to allow the free-flow of uninterrupted drainage patterns.

Another watershed factor to consider is a hydraulic seep, where subsurface water comes to the surface. Continuously wet sections along a trail are unable to process stormwater, creating wet trail subgrades that will wear out under heavy use. Regardless of the type or magnitude of surface or subsurface water, trail planning must predict these effects and recommend an appropriate design solution before trail damage occurs.

A primary design goal of any trail should strive to protect all natural drainage patterns with unrestricted flow. Special attention should be given to avoid delineated wetlands, or at the very least, use wetland mattes, corduroy bridges, puncheons, or boardwalk bridges to cross them. Changing the direction and natural flow of water may negatively affect ecosystem functions.

Trail Surface Drainage

Water on the trail surface plays a significant factor in the long-term health of the trail. Predicting stormwater impacts on a trail must consider how rutting, ponding, and erosion may compromise the trail surface. Most trail surfaces allowing stormwater to sheet flow over the trail cause little if any damage. If water collects on the trail surface in puddles, subsidence will degrade the integrity regardless of whether it is natural soil, graveled, or asphalt. A cross slope of 2% is generally sufficient to cross drain water off the trail. This detail should be noted on the design details in order "for all surfaces to drain properly."

When possible, drainage is best accomplished using cross drainage (moving left or right) off the trail surface. If water is moving horizontally along the length of the trail, special care should be exercised to prevent erosion. Creating grade changes (rolling humps and valleys) every 200-300' provides the easiest way to limit the length water must flow down a trail surface. The employment of waterbars (a raised log or series of rocks typically constructed several inches

above the trail at 45-60 degree angles to the trail) helps divert water off the trail into channels or discharge points to eliminate soil erosion. Waterbars are acceptable for nature trails and wilderness trails, but (for those trails requiring a smooth accessible surface) it creates a tripping hazard. Bikers may enjoy the challenge of rough terrain but they may slip on wet waterbars.

In some cases, drainage swales may be necessary to collect water and channel it away from the trail. Minor surface water collection and directional changes may result from the installation of ramps and turnpikes. The collection and movement of water to drainage pipes should not significantly alter current drainage patterns nor disrupt microhabitat situations. Make sure all trail surfaces drain and adjacent areas do not erode the trail.

Tree preservation

Trail planners understand the key role that trees play in trail planning. User surveys consistently value tree-lined trails as most desirable and very pleasant to walk on. They create shaded walkways and add scenic interest. There are some negatives associated with trees. If tree root barriers are not included in the trail material cross section, tree roots will invade the trail subgrade causing asphalt to heave, concrete to crack, and tripping hazards on nature trails.

In areas where trails are woven through existing trees, impacts to surface roots must not compromise the health and vigor of the tree. The depth of tree roots vary according to tree type, soils, and proximity to water. Tree roots need oxygen in the soil for optimum health, so roots growing in hydric soils with high quantities of water will grow very close to the surface. On average, trees in James City County have roots that are typically 14-18" deep, with some roots as deep as 24". When trail grading to a depth of 8" occurs, surface feeder roots will be removed but large subsurface roots will remain. If large roots are broken during construction, they must be re-cut to produce a clean wound that allows the root to heal.

A woven geotextile installed under the trail and continuous up the sides will prevent tree roots from growing large enough to compromise the trail. In most cases, trees can have 20-25% of their roots removed with little damage to the trees' health; however, this may weaken the structure of the tree and cause it to become wind-thrown. It is good horticultural practice to include a fertilization maintenance program by a certified arborist for 3-5 years to help impacted trees recover. This cost is easily recouped should a dead tree have to be removed later on, or dead limbs fall on unsuspecting trail users.

Buffers

Creating trail buffers provide designers the greatest latitude and discretion in trail planning. Once the trail width, clear zone, and corridor width have been determined, buffers are then planned to provide aesthetic character to the trail. Depending upon location and proximity to buildings, roads, or incompatible land uses, buffers can be designed to enhance landscapes or revegetate natural buffers. Buffers also provide privacy between the trail and adjacent property owners.

Another issue to consider is the planting of trees or shrubs too close to the trail. Shrubs should be located at least 6-12' from the edge of trail to prevent mature growth from compromising clear zones and sight lines. Sight lines allow trail users to have relatively long unobstructed

views through the trail corridor void of blind spots. If people "perceive" a trail as unsafe, users will find other trails to enjoy. Trail corridors with minimum buffer requirements vary between 35-100', depending upon the location, context, adjacent land cover, and surrounding land uses.

9.3 Multiuse Trails and User Conflicts

Most trail experiences are very enjoyable and satisfying. On occasion, conflicts on multiple use trails do occur. When recreational trail users seek a particular recreational experience, they may come into conflict with other trail users seeking differing experiences. This may happen among users of similar or different recreational types. In order to provide optimum recreational experiences for all trail users, minimizing conflict will significantly enhance the recreational enjoyment of all trail users

"Shared use paths should not be used to preclude on-road bicycle facilities, but rather to supplement a system of on-road bike lanes." [77]

Conflict in outdoor recreation settings (such as trails) can best be defined as "goal interference attributed to another's behavior" (Jacob and Schreyer 1980, 369). Trail managers can "employ a wide array of physical and management options such as trail design (elements), information and education, user involvement, and regulations and enforcement."[78] Following accepted trail design standards for multiuse trails, as outlined in Section 9.3, recognizes that increases in the number and type of users will determine modifications to recommended design width standards, thereby preventing conflicts. Other methods of reducing the incidence of conflict can be accomplished through prevention programs, including the posting of trail etiquette rules and following "12 Principles for Minimizing Conflict."[79] (Refer to Appendix 13.7)

9.4 ADA Accessibility Issues

The general rule for handicap accessibility, as described in the Americans with Disabilities Act, specifies that "reasonable" accommodations must be provided for all public facilities. Newly adopted ADA guidelines specify how public access should be provided on parks and trails, including trail access for the first 500' and/or to the first point of departure to a prominent feature. Sustained horizontal grades must be 5%, not to exceed 200' for 8.33% grades, and not to exceed 30' for 10% grades. A firm trail surface should provide cross slopes less than 3% and elevation changes not exceeding 2 inches. Accommodations for wheelchairs should be the basic rule-of-thumb for trail accessibility.

9.5 Construction Means and Methods

Contractors should specify the means and methods used during the construction bid process. A contractor may be chosen based upon construction methods and equipment types if it is determined they may minimize impact to the site. Work should be scheduled to occur within narrow construction windows when soils are driest, typically June - November. Changes to the

[77] AASHTO, Guide for the Development of Bicycle Facilities, 1999, p.33.
[78] Conflicts on Multiple-Use Trails, Roger L. Moore, sponsored by the Federal Highway Administration, August 1994, p.1.
[79] Conflicts on Multiple-Use Trails, Roger L. Moore, sponsored by the Federal Highway Administration, August 1994.

environmental window must include restrictions if nearby Ospreys (March-June) or Bald Eagles (December–March) are breeding.

9.6 Trail entrances, intersections, parking, and neighborhood access

Providing public access points for trails is an essential component of any trail design. Properties providing access can be acquired in title ownership or by a permanent easement. These access points are used for construction, maintenance, security, and as gathering points for organized trail hikes and trail day celebrations. Trails that provide neighborhood access will not require parking facilities, as they are within walking distance of most homes. Public parking is necessary to accommodate the needs of citizens when they must drive to reach the trail. Rather than build new parking facilities, opportunities to share existing paved parking lots nearby should be explored. Schools provide excellent places for trailhead parking. These parking lots are available to the public during non-school hours (afternoons and weekends), the times when trail users are expected to use the trail. When trail access is needed during schools hours of operation, other parking lots that satisfy these conditions would need to be explored.

When trail entrances intersect public roadways, vehicles have the right-of-way. On private streets and driveways, pedestrians have the right-of-way. When there is the expectation that trail users will enter onto the road, safety principles must be employed. Typical safety measures include striped walkways, vehicular "Trail Crossing" warning signs, generous clear zones and sight line distances, pedestrian stop signs, curb cuts, and perhaps street lighting. When high volume roadway traffic poses a significant risk to trail users, at-grade crossings may require upgrading to elevated bridges to reduce the risk of accidents, especially among young children.

9.7 Structures: bridges, boardwalks, and puncheons

Hard construction structures along trails, such as bridges, boardwalks, and puncheons, help to enhance the quality and character of any trail experience. Aside from providing safe crossings over streams, ravines, and wetlands that protect those environmental resources, footbridges can also add interest to the trail when winding trails weaving through woodlands are interrupted at specific intervals with footbridges or puncheons. When marginal lands with steep slopes and wetlands are acquired for trail development, thus requiring the need for extensive hard structures, implementation costs may be dramatically more than what was first estimated. Depending upon the proposed width of a boardwalk on piles, the construction costs ($125 LF) may approach that of new road construction ($200 LF). When properties are proffered to the County for public trails, these structural elements must be factored into any proffer negotiations.

9.8 Site Furnishings

Perhaps the single greatest design factor influencing trail users perception of a trail facility occurs within the realm of site furnishings. These trail amenities quickly add to the construction costs but are invaluable towards providing a quality trail experience. Some furnishings include:

- Trailhead signs- these signs are posted at the beginning of the trail with the name of the trail and the agency responsible for the facility. In addition, trail etiquette signs are also located here to educate users about the trail and notifying them of any restrictions.

- Kiosks- these interpretive trailhead signs may be necessary to describe the environmental or historical significance of the site, as well as maps of the area depicting the route of the trail, adjacent neighborhoods, and any loops or connecting trails nearby.
- Signage- simple signs indicating access points and neighborhood connections are invaluable when walking though the woods when physical landmarks are absent.
- Bollards- these are posts placed at trail entrances to limit access by motorized vehicles. In some cases, collapsible bollards are used to permit access for maintenance vehicles.
- Interpretive Signs- when interesting environmental or historical features are discovered, these signs can be used to describe the event or the significance of the resource that may be of interest to trail users. The Greensprings Trail has an interpretive program where 50 sites have been documented into a unique cultural experience that is used by local schools as part of their biology and history programs.
- Trailblazer Signs- these signs help inexperienced trail users from getting lost in the woods. They are typically small and posted on trees. On wilderness trails, these trees may simply be marked with paint to designate the trail as well as other markings indicating the character of the trail and nearby facilities. In some cases, official roadway signs may be posted for motorists indicating where the trailhead is located.

9.9 Cost Estimates

Cost estimates for trail construction	**Width**	**Unit cost***
Soft surface/natural, typical	6’	$5.00 LF
Greensprings Trail- gravel/natural surfaces	5-6’	$5.31 LF
Gravel trail surface w/easy access	6’	$10-12 LF
Gravel trail surface w/difficult access	6’	$18.50 LF
Greensprings Trail/all surfaces	5-6’	$17.85 LF **
Asphalt trails	6’	$17.00 LF
Asphalt multiuse trails	8-10’	$25.00 LF
Sidewalks 4” concrete	4’	$31-36 LF
Puncheons	6’	$67.00 LF
Boardwalk on piles	6’	$125.00 LF

(Note: These costs vary depending upon terrain, other environmental factors, economies of scale, etc.)

* Installed costs do not include design, engineering, project management or land acquisition.

** These numbers reflect historical costs for all improvements on the Greensprings Trail.